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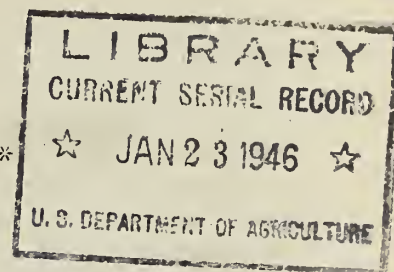
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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

OCTOBER 1945



EROSION CONTROL PRACTICES DIVISION

Higher Tomato Yields Following Sod and Cover Crops - Oren R. Neal,
New Brunswick, New Jersey. - "Tomato yields in 1945 from four cropping systems
involving different degrees of clean cultivation and cover crops were as
follows:

Number	Cropping system	Tons per acre
1	Peas-snapbeans, tomatoes, sweet corn.....	14.7
2	Clover-timothy sod, tomatoes, sweet corn..	16.7
3	Peas-ryegrass and vetch, tomatoes with 10 tons compost and rye cover, sweet corn with ryegrass and vetch.....	17.8
4	Clover-timothy sod, tomatoes with 10 tons compost and rye cover, sweet corn.....	18.4

"The 1945 season represents the first year of the second rotation cycle in all the above cropping systems. Data presented previously have shown that Systems 2, 3 and 4 are progressively more effective in controlling runoff and soil loss as compared with the continuous clean cultivation of System 1. The above data for tomatoes and those shown in our August report for sweet corn indicate that the cropping systems most effective in conserving soil and water are also most effective in increasing crop yield."

Algae and Fungi Add Organic Matter - Joel E. Fletcher, Tucson, Arizona. - "The surface growth of algae and fungi noted last year on the range soils, has been observed in counterpart in the small, bare, surface areas between plants of certain cover crops. The algae development seems to be particularly well developed in association with alfalfa. If it is assumed that the surface crust had the same amount of carbon and nitrogen as the layer immediately below it before the algae came in, then it has gained 56.9 pounds of nitrogen and 636 pounds of dry organic matter per acre. Under Rhodes grass these figures become 6.8 pounds of nitrogen and 972 pounds of dry organic matter per acre."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Supplemental Irrigation Produces 2.6 Tons More Beets Per Acre -

John Lamb, Jr., Ithaca, New York. - "There was a dry period the latter part of August in this locality. The Needham Farm has two small brooks of spring water coming together on their farm and leaving as one stream. Dr. Moore arranged for our experimental irrigation outfit to apply water to a beet field on August 28. Within one hour after arriving at the farm, water was falling on one acre at the rate of 250 gallons per minute. The smaller stream supplied all this, with water left over. A total of 1.6 inches was applied. The beets were harvested October 19. The watered section yielded 14 tons per acre, an increase of 2.6 tons over that not watered. Some beets sold as high as \$35 per ton. The cost of applying water in such a location using a 1,000 gallon per minute pump would be less than \$5 per inch.

"Two other trials using supplemental irrigation on beets, cabbage and potatoes were failures because of failure to control weeds, insects and diseases.

Twelve Tons Soil Loss on Winter Rye Plot in September. - "The precipitation from September 14 to October 3, 1945 was 9.91 inches. Soil and water losses during this period are indicated in the following table. The soil loss (12 tons per acre) where winter rye was sown September 22 was from a plot only 72.5 feet long on an 8 per cent slope. This is probably a conservative estimate of the damage these storms caused on much of the acreage sown to wheat and rye in Ontario County and vicinity.

"Soil and water losses measured at Geneva, New York,
September 14 to October 3, 1945

Treatment	Soil loss	Water loss
	Tons/Acre	Inches
<u>Ontario Soil, 8 per cent slope</u>		
Blue grass sod.....	0.000	0.055
Soybeans, fall plowed, weedy.....	.071	.260
Soybeans, spring fitted, trashy surface.....	.001	.015
Buckwheat, spring fitted, trashy surface, very weedy.....	.001	.019
Summer fallow, winter rye.....	11.997	3.754
Fallow.....	25.964	6.233
<u>Dunkirk Soil, 5 per cent slope</u>		
Wheat stubble, clover.....	0.917	3.036
Fallow.....	22.696	7.651

Contour Cultivation Reduces Potato Yields on Poorly Drained Soil. - "The contour vs. up and down hill potato yields experiments are on Mardin and Volusia soils at the Arnot. The past, wet season conditions were not favorable for potato growth, especially with the contour rows. The contour rows gave an average yield of 84 compared to 92 bushels per acre for the up and down row hills. It is obvious that these rows should be on a terrace grade rather than the exact contour. Drainage terraces would be very much in order for these plots.

Potatoes After Clover Show Improved Yield Over Potatoes After Potatoes.-

"Potatoes following barley and clover gave an average yield of 102 bushels per acre. The second crop of potatoes following barley and clover gave an average yield of 75 bushels per acre. This increase was probably chiefly due to the improved physical condition of the soil, since extra nitrogen in another experiment gave no increase in yield."

No Ill Effects of Straw Residues on Stand or Vigor of Wheat -

Hugh C. McKay, St. Anthony, Idaho.-"A good stand of fall wheat was obtained on all of the fall seeded plots. The amount of straw on the surface had no effect on the stand of wheat or its vigor this year. The growth of the wheat is not so great as last fall, but it is in a better condition to come through the winter without winter killing due to snow mold.

"On the sweet clover trial plots the best stand of wheat was obtained on the modified moldboard plots rather than on the moldboard plowed plots. The modified moldboard plowed plots seemed to have a firmer seedbed. However, the stand of wheat obtained on the moldboard plowed plots was quite satisfactory. All of the sweet clover residue left on the surface by the modified moldboard plow did not seem to have any bad effect on the emergence or growth of the fall wheat.

"The date of plowing under the sweet clover, that is, early or late, did not have as much effect on the growth of the wheat this year as it did last year. This was probably due to the large amount of rainfall received after the last date of plowing."

Moldboard Plow and Field Cultivator Produce More Wheat than Stubble

Mulch Tillage - Carl L. Englehorn, Fargo, North Dakota.-"Triplicated yields are as follows:

Tillage method	Wheat yield per acre, bushels			
	1	2	3	Average
Summer fallow				
Moldboard plow.....	18.5	18.3	24.8	20.5
Field cultivator.....	17.8	19.0	23.4	20.1
Moldboard plow, pit.....	18.5	20.0	24.0	20.8
Stubble mulch tillage.....	16.5	18.0	18.2	17.6
Fall tilled stubble land				
Stubble mulch tillage.....	9.1	9.2	9.1	9.1
Oneway disk.....	11.0	10.0	11.5	10.8
Field cultivator.....	10.7	10.3	9.5	10.2
Moldboard plow.....	13.5	13.1	12.2	12.9
Spring tilled stubble land				
Moldboard plow.....	12.2	11.8	11.4	11.8

"On the summer fallow plots, stubble mulch tillage produced a lower yield than did the other methods of tillage. Tillage with the field cultivator yielded as well as tillage by moldboard plow. The 'pitting' in the fall of plowed fallow shows no yield advantage.

"As has been the tendency during previous years, yield on stubble land tilled for spring seeding to wheat, tends to vary with the degree of incorporation of stubble residues with the soil. Under stubble mulch tillage, by which residues are left on the surface, 9.1 bushels an acre were obtained whereas under fall plowing by which all residues were turned under, 12.9 bushels an acre were produced. Tillage with the field cultivator and the oneway disk produced a higher yield than did stubble mulch tillage but did not equal the yield produced by plowing."

Stubble Mulch Method Spreading in Western Nebraska - F. L. Duley, Lincoln, Nebraska.-"The stubble mulch method of producing wheat seems to be spreading more at present than for some time. This is due to the fact that more equipment is now becoming available and also to the fact that a few of the best farmers have been highly successful in using the method. Mr. Oscar Miller at Stratton, Nebraska, farms about 900 acres of wheat entirely by the stubble mulch method. He uses several methods of preparing his fallow. Where the straw is excessive he cuts this first with a oneway disk, then uses his attachment on the rod weeder for a subtiller for later operations. Practically all the farmers in his community are using similar methods. Mr. Bart Armstrong at Chappell, Nebraska, has 2,000 acres of wheat this fall, 1,900 acres of which was summer fallowed by the stubble mulch method. He grows about 70,000 bushels of wheat a year and feels that he has almost completely eliminated both wind and water erosion. Plowed land on an adjoining farm presented a horrible example of water erosion as the result of a recent torrential rain."

Higher Oat Yields in 6-Year Rotation - Orville E. Hays, LaCrosse, Wisconsin.-"The yield of oats from the terraced watershed reflects the effect of organic matter increase resulting from a 6-year rotation as compared with a 3-year rotation. Where the rotation consisted of corn oats and 4 years of alfalfa brome Meadow the yield of oats was 12 bushels per acre higher than where a rotation of corn, oats and one year of clover timothy meadow was used on terraced land.

Terraces Hold Soil and Fertilizer Lost Between Terraces.-"In a study to determine the yield of crop from terrace inslopes, channels and ridges as compared with the area between terraces the yield of oats was higher by 10 bushels per acre from the area disturbed during terrace construction (i.e., inslope, channel and ridge), than from the area between the terraces which was not disturbed when the terraces were constructed in 1932. Similar results were obtained last year when the terraces were in corn. The corn yield was greater by 9 bushels per acre on the inslope, channel and ridge than on the undisturbed area. This indicates that the runoff between terraces is carrying some topsoil as well as fertilizer and manure and that by terrace maintenance this has become mixed over the entire area disturbed by terrace construction so that it now supports a higher average yield."

Livestock Farms Have Higher Yields on Slowly Permeable Soils -
E. L. Sauer, Urbana, Illinois.-"Farm account records for farms which are representative of the slowly permeable problem soils of northeastern-central Illinois were selected in Ford, Livingston, Iroquois and Vermilion Counties. Much confusion and uncertainty exists regarding the many soil types and classifications of this area. Hence, it was difficult to locate a large number of records which could definitely be classified in any one of the particular problem soil types.

"The accompanying table compares selected items on identical farms with Elliott-Ashkum Swygert-Bryce and Clarence-Rowe soils for the years 1940-41 and 1943-44. These farms represent better-than-average management and operation. They indicate the possibilities of this land under such management and operation after an improvement program has been in operation for a number of years.

"The farms having the best soils (Elliott-Ashkum) are largest in size and have the most tillable acres. These farms also tend to keep more of their land in legumes, hay, and pasture, feed more livestock, have highest crop yields, and highest net returns. While only two farm records are available from the poorest soils (Clarence-Rowe), they are lowest in most of the items. These two records represent distinctly superior management and operation for Clarence-Rowe farms.

"The intensive land use program on these farms (with a high per cent of the land in corn and soybeans) is at present yielding high returns. Based on long-time record studies in other areas, a larger proportion of the land must be in legumes (clover and alfalfa) if soil fertility is to be maintained and erosion prevented. Unless this is done, both crop yields and earnings will decline.

"Yield comparisons for a grain and a livestock farm on Clarence soils show that the livestock farm had a distinct advantage in corn yields. Oats yields on the livestock farm have improved relative to those on the grain farm since 1934. There was little difference in soybean yields on the two farms. The acre yields of all three crops on the livestock farm located on these very slowly permeable soils fluctuated around the average for all record-keepers in the County while the corn and oat yields on the grain farm on this same soil type were only about 70 per cent of the County average during the same period.

"Selected items on identical account-keeping farms on problem soils, 1940-41 and 1943-44 (Ford, Iroquois, Livingston and Vermilion Counties)

Item	1940-41 average			1943-44 average		
	Soils			Soils		
	Elliott-Ashkum	Swygert-Bryce	Clarence-Rowe	Elliott-Ashkum	Swygert-Bryce	Clarence-Rowe
Number of farms.....	13	12	2	13	12	2
Acres per farm.....	281	268	234	272	269	225
Value of land per acre...	\$122	\$108	\$ 73	\$124	\$108	\$ 73
Total farm invest./acre..	\$186	\$163	\$128	\$207	\$180	\$151
<u>Earnings</u>						
Net income per acre....	\$ 19.35	\$ 14.65	\$ 13.87	\$ 28.72	\$ 22.19	\$ 18.80
Rate earned on invest..	10.4%	9.0%	10.4%	13.8%	12.3%	12.5%
<u>Land use</u>						
Tillable acres per farm	266	252	215	256	252	206
Pct. of farm tillable..	95	94	92	94	94	92
Pct. tillable land in:						
Intertilled crops....	45	42	51	56	53	62
Small grains.....	25	27	16	21	23	22
All hay and pasture..	30	31	33	23	24	16
Legume hay & pasture.	25	25	28	19	18	9
<u>Crop yields</u>						
Corn, bus. per acre....	57	53	49	61	52	45
Soybeans, bus. per acre..	20	18	17	24	20	21
Oats, bus. per acre....	58	50	53	37	29	31
Value of feed fed per acre.....	\$ 11.62	\$ 6.32	\$ 4.38	\$ 25.41	\$ 11.89	\$ 11.87

Contour Listed Grain Sorghum Lodges Less - Alvin E. Lowe, Garden City, Kansas.-"The sorghums on the basin project have fully matured to what will undoubtedly be the highest yields in the history of the project. By the end of October they had dried sufficiently that they could be combined when convenient. It was noted that one plot was lodging some, whereas, all other plots were standing perfectly. This one plot was the continuously grown plot that was listed up and down the slope. This lodging indicated the the plants had not developed normally as they had run short of moisture. All other plots and especially those on the contour were standing good and made a definite contrast. A combine sorghum must stand or be lost so this observation is very significant."

Pitted Pastures Produce More Gain - Oscar K. Barnes, Laramie, Wyoming. - "The two pastures pitted in 1942 again carried more sheep than the non-treated check pastures, with more grass left at the end of the season. The percentage difference was 41 per cent more sheep per acre with 50 per cent greater gains per acre for ewes and 36 per cent more for lamb gain per acre than non-treated range produced. The difference in per head gains was smaller.

"The group of pastures including one pitted and another grooved at 2-foot intervals in 1939 were grazed 34 per cent heavier than the non-treated check pasture. A partial summary of the utilization indicates the vegetation on the treated pastures was more nearly equal to the non-treated pasture than was the case of the pastures pitted in 1942. The lamb gains on the pitted pasture of this group were very low, about 11 pounds less per head than those on the non-treated pasture. There is no apparent explanation for this as the ewes made satisfactory gains and the age of the animals was comparable to those on the other pastures. The per head gain on the grooved and non-treated pastures were practically equal. Due to the difference in stocking rate the lamb gains per acre were as follows: grooved pasture 40 per cent more than the non-treated pasture and the pitted pasture showed an advantage of only 16 per cent.

Gains on Sheep by Rate of Grazing. - "The rate of use study includes comparisons of vegetative response to these rates of use by sheep, also the soil moisture and forage production relationship to these rates of use. The second year of this study is completed in 1945. The grazing rates and gains for this year are as follows: light use 42 per cent less grazing than the moderate rate of use and the heavy rate 50 per cent greater than the moderate rate of use. The gains per head were reasonably close for the light and moderate rates. The lambs gained 5 pounds less per head on the heavy used pastures and the ewes 10 pounds less per head. Marked differences would not be expected until later in the life of the study. The lamb gains per acre show light rate 36 per cent under the moderate rate and the heavy rate 40 per cent above the moderate rate.

"All of the native range pastures were grazed approximately between the dates of May 5 to September 15, 1945. Details on gains and rate of grazing for the various treatments and rates of use are as follows:

Treatment and rate of use	Total days grazing	Sheep days/acre	Gain per head		Gain per acre	
			Ewes	Lambs	Ewes	Lambs
Pitted, 1942.....	141	86	38.7	58.1	23.2	43.6
Non-treated.....	131	61	33.3	54.9	15.5	32.1
Pitted, 1939.....	130	84	30.8	46.4	19.5	36.6
Grooved 2 feet, 1939.....	130	81	28.8	58.0	17.5	44.0
Non-treated.....	137	61	34.5	57.8	15.0	31.4
Light grazed.....	114	36	27.4	52.2	8.5	20.6
Moderate grazed.....	127	61.5	33.5	53.2	16.1	32.1
Heavy grazed.....	124	92.5	22.9	48.4	17.1	45.1

"Lambs Prefer Blue Grama.-"On the blue grama-buffalo grass pasture the rate of use was comparable with past years, but the animal gains were excessively low. The lambs averaged .1 pound gain per day compared to .3 pound per day for lambs on native range for the same period. A similar difference occurred in the ewe gains. The only explanation at this time is that the buffalo grass in the mixture has continued to increase at the expense of the blue grama. The seeding mixture used in 1941 was 9 pounds of blue grama and 1 pound of buffalo grass. This was approximately the per cent stand originally obtained. The buffalo grass has continued to increase in density and to a great extent at the expense of blue grama until now the stand is 60 to 70 per cent buffalo grass. The lamb gain per acre has followed the same trend in reverse. Beginning in 1942 through 1945 the lamb gains were as follows: 101, 62, 37, and 17 pounds per acre.

"It has been observed for some time that the sheep take buffalo grass only when they are forced to it. This has been true on this seed pasture and on the native range."

California Lima-Bean Crop Short in 1945. - Maurice Donnelly, Riverside, California.-"This was a poor year for lima beans. Soil water was short. Insects were plentiful. August was so hot in most sections that pod growth practically stopped. On dry land, where 10 sacks (100-pound) per acre is the rule in good years, the yield this year was about 6 sacks.

"The yields of lima beans from experimental fields at Somis were, in some cases, somewhat better than the average for similar land. We had had indications previously that there has been a gradual improvement in the productivity of a few of the fields there, largely caused, we believe, by a gradual improvement in soil structure. This trend has begun to show generally in the fields at Somis, undergoing treatments that maintain or improve soil structure.

"One important fact disclosed by this year's results at Somis is the need for information on the spacing of lima beans in relation to the supply of soil water. On account of the short supply of soil water this season, yields were better where the number of plants were reduced to some extent by wire-worm damage. On those fields where wire-worm damage was practically zero, too many plants were established and when the stress came in the hot days of August for water there was not enough to carry so many plants through to full bearing. In order to provide more flexibility in the spacing of lima beans when planted, present planters would have to be redesigned to permit a readier adjustment of the spacing gears.

How Much Erosion in Citrus Orchards Where Soil Is Kept Bare by Oil Spray Methods?-"Field workers have been urging for several years to provide them with guideposts on erosion factors in citrus orchards on sloping land where the soil is kept bare of all cover by oil spraying. Some earlier work (unpublished) was done in non-tilled citrus and avocado orchards but in these the soil was not bare of cover. There is an undoubted need for information on erosion factors in citrus orchards in this oil spray program, particularly as there is now a tendency to carry out this treatment on lands that are quite steep."

Kudzu Rotation Increases Corn and Cotton Yields on Steep Land - J. C. Moore, Auburn, Alabama.—"In 1939 an area of approximately 8 acres of poor hilly land was set aside to test the possibility of Kudzu on the farm. Three objectives were set up: (1) to see if terraces could be established by throwing dirt with a common two-horse plow against the Kudzu barrier; (2) to see if the vines from the Kudzu barrier would cross the strips between barriers, thus establishing Kudzu to be used in a rotation; (3) to determine the effect of Kudzu in a rotation of row crops.

"Results of this experiment to the present time indicate that, with moderate slopes, these objectives can easily be reached.

"Kudzu was planted on contours in the spring of 1939. Three rotations were set up in triplicate plots randomized so that variations in soil types, per cent slopes and degree of erosion would be found in all rotations. The rotations used in this experiment to measure the value of Kudzu were: (1) Corn - Kudzu - Kudzu - Cotton; (2) Cotton - Vetch - Corn; (3) Cotton - Corn.

"During 1945, cotton following kudzu without nitrate produced 31 per cent more cotton than did cotton in the Cotton-Corn rotation fertilized with 600 pounds of 6-8-4 fertilizer and 321 per cent more cotton than was produced in the latter rotation where 600 pounds of 0-8-4 fertilizer was used.

"During 1945, corn without fertilizer following cotton that followed kudzu produced 16 per cent more corn than was produced in the Cotton-Corn rotation where 200 pounds of nitrate of soda was used and 192 per cent more corn than was made where corn received no fertilizer. This shows that the residual effect of Kudzu holds over in the soil for more than one crop.

"Corn and cotton yields in 1945 were as follows:

Preceding crops	Fertilizer		Yield per acre
	Analysis	Per acre	
		Pounds	Pounds
Cotton in 1945 preceded by -			
Two years Kudzu.....	0-8-4	600	324
Corn and vetch.....	12-8-4	400	140
Corn and vetch.....	0-8-4	400	87
Corn.....	6-8-4	800	247
Corn.....	0-8-4	800	77
Corn in 1945 preceded by -			
Cotton and 2 years Kudzu....	None		1,506
Cotton and vetch.....	None		819
Cotton and vetch.....	None		641
Cotton.....	Nitrate of soda	200	1,298
Cotton.....	None		536

Hubam Germination Increased by Scarification - H. O. Hill, Temple, Texas.-"Poor stands of hubam clover have been common from fall seeding of new unscarified seed. A recent test of the value of scarification indicated that the germination can be increased from 27 per cent to 91 per cent by effective abrasive scarification.

Heavier Cowpea Growth with Soil Aeration.-"In a greenhouse test of soil aeration, Dr. Johnston obtained information on the growth of cowpeas under different soil tilth conditions. The increased growth of cowpeas on the unpuddled soils indicates the value of a well aerated seed bed on heavy soils.

Treatment	Air-dry weight of cowpea tops pro- duced *
	Gms.
Soil puddled.....	17.5
Soil packed in pots.....	23.4
Soil finely granulated (natural tilth).....	23.4
Soil finely granulated straw mulch on surface.....	28.9

*Average of 3 replicates."

Weeping Lovegrass Protects from Over-Grazing - R. M. Smith, Morgantown, West Virginia.-"In seedings on critical erosion areas, weeping lovegrass was successfully used to protect associated legumes and grasses from over-grazing. This grass proved to be unpalatable enough to permit from six inches to a foot or more of growth to stand adjacent to very closely grazed pasture, thus giving the desired protection to the critical area. This technique appears promising as a means of revegetating numerous small, barren areas in grazing land which cannot be satisfactorily fenced, especially when animals are attracted to the better portions of the pasture by lime, fertilizer, and seed of highly palatable species."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"At the project headquarters rainfall amounted to 2.75 inches, falling on 11 days. The storm of October 1 - 2 was the largest, totaling 1.18 inches. Only small amounts of runoff resulted from this storm as the intensities were not excessive.

"At the time 1 inch of rain fell at headquarters, October 1 - 2, over 2-1/2 inches of rainfall was recorded on a watershed 5 miles to the northwest. As about 2-1/4 inches fell in 3 hours and the soil was very wet, high rates of runoff resulted. Only maximum stages can be given as these runoff stations are not yet calibrated. Word of the occurrence of this intense storm did not reach us in time to permit flow measurements at the high stages. The depth of the flood peak of October 2, is compared with previous maximum depths below:

Watershed: Drainage : Previous : Peak depth			
No. :	area :	maximum :	on Oct. 2
:	:	depth :	:
	Acres	Feet	Feet
297	6,800	7.89	8.62
993	11,800	5.92	8.86

"Discharge measurements made at station No. 11 are checking the laboratory calibration of the 5:1 broad-crested V-notch weir very well. Considerable work has been done on removing sediment both above and below the weir at station No. 5."

Hydrologic Studies - I. W. Bauer, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"October has been a dry month, with only .36 inch of moisture. This is the lowest amount recorded at the meteorological station for October for our period of record.

"Good stands were obtained on all the watersheds. More moisture could be a big benefit, as there are only 4 inches of available moisture in the top three feet of soil."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"Total rainfall averaged 2.38 inches and 2.33 inches at the Throckmorton and Dairy Experiment Farms, respectively. 'Normal' October rainfall for the locality is 2.66 inches. Light runoff occurred on several of the experimental watersheds from three rains of considerable less than an inch.

"The following table shows the corn yields, determined by intensive sampling. (Yields are on basis of 70 lbs. per bu. at 15 percent moisture).

1945 Corn Yields from Experiment Watersheds
Under 'Prevailing' Practice and Conservation Treatment
Purdue-Throckmorton Farm, Lafayette, Indiana

Treatment <u>1/</u>	Watershed	Yield bu/A	Plants/A	Ave. Ear wt., oz.
Prevailing	10	70	9,147	8
	15	73	9,614	9
	Average	71	9,380	8+
Conservation	18	128	11,761	12
	14	116	11,481	11
	Average	122	11,621	11+

1/ Corn, wheat, meadow rotation, 'square' tillage and seeding, common (light) fertilization on prevailing-practice watersheds; same rotation contour seeding, heavy fertilization and manure plowed under for corn, heavy fertilization and manure top dressing of wheat on conservation-treated watersheds; 1st year of 2d rotation under differential treatment.

These data indicate a difference in yield of 51 bushels per acre resulting from the conservation treatment. The same watersheds were in corn in 1942 with a 25 bushels per acre difference, for the first year of the differential treatment. The 1942 average yields were 69 and 91 bushels per acre for the prevailing-practice and conservation treatments, respectively.

"The rainfall from June through September in 1942 was 18.45 inches and 20.86 inches for the same period in 1945. Runoff losses during the growing season were practically the same from the prevailing-practice watersheds for the 2 years; but substantially less from the conservation-treated watersheds this year. The net rainfall available to the crop was about 2-1/2 inches more this year on the prevailing-practice watersheds and approximately 4 inches more on the conservation-treated watersheds.

"It may be noted that there was little difference in yields from the prevailing-practice watersheds for the 2 years, the increased difference between the two treatments being due to higher yields from the conservation-treated watersheds this year than in 1942. This may indicate that available plant foods limited the yields from the prevailing-practice watersheds both years; whereas available plant food on the conservation-treated watersheds was sufficient to utilize the additional 4 inches of

water available, to produce 25 more bushels of corn per acre. Reduced water losses and increased yields in the second rotation both indicate a trend of improvement under the conservation treatment."

Hydrologic Studies - R. G. White, East Lansing, Michigan.-"During the month the rainfall measured 2.34 inches at the cultivated watersheds, 2.25 inches at the stubble-mulch plots, and 3.27 inches at the wooded watershed, as recorded by the Standard Weather Bureau type non-recording raingage. The 40-year average for October for East Lansing is 2.39 inches. Rainfall was almost normal at the cultivated watersheds and stubble-mulch plots, but was nearly 1 inch above normal at the wooded watershed. This was largely a result of the rain of October 30, when 0.20 inch fell at the cultivated watersheds, but 0.86 inch fell at the wooded watershed. At the cultivated watersheds, the 1945 rainfall as of October 31 was 9.10 inches above normal for that date. There was no runoff at any of the watersheds during the month, and no soil loss.

"The article 'Installations for Noting the Water and Thermal Relations in Soils' was completed and forwarded to Washington for approval."

Hydrologic Studies - John Lamb, Jr., Ithaca, New York.-"Seventeen days with 36 degrees and lower, 8 days of 65 degrees and above, plus 19 days in which precipitation fell, were recorded.

"Peak runoff occurred on October 2, when 0.35 inch of rain fell in 10 hours, followed by 0.45 inch in 50 minutes. Idle-land peak was 0.0867 inch per hour, as against 0.0224 inch from the wooded watershed; both areas having soil at field capacity at the beginning of the storm."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"About 2 weeks have been spent in the field during the past month examining structures in Buffalo and Trempealeau Counties. During the first week, I was accompanied by Mr. A. J. Wojta who is representing the College of Agriculture on this work. Because of the large number of structures involved, we have decided to study them by type and the box-type spillway which is applicable to the large drainage areas and low heads was selected as a starter because of the small number of this type of structure and the possibility of wide application.

"Observations thus far have covered only the present condition of the structure as determined from a physical examination. No surveys have been made of ponds, downstream channels, soils, or land use. Farmer interviews are to be made later when they will not interfere with the farming operations.

"With this incomplete picture, it is rather difficult to draw any definite conclusions. Certain structural weaknesses were apparent in some of the structures and, where the original designs are available, they will be sent to the Regional Engineering Section for their checking and comments. As an illustration, the downstream wing walls have broken off from the side walls of several of the structures due to a lack of sufficient reinforcing steel at this point.

"Twenty-five structures on drainage areas varying from 85 to 2,900 acres with an average area of 500 acres were examined during this period. The average age of this group of structures was about 10 years. Of this number, two may be classified as complete failures, one of which may have been prevented by prompt and proper repair of the earth fill. Both of these failures may be charged to a wet foundation condition. A number of the fills have been improperly maintained, the most common fault being hog and cattle damage, and unless these are repaired soon, they may result in ultimate failure.

"About one-third show some cutting at the outlet, but the downstream cut-off wall has been undermined in only one instance. On the one in which the cutoff is undermined, there is a large pond about 30 feet in diameter and several feet deep just downstream from the structure which the farmer says has existed with little change in size or depth during the last 5 years. The foundation under this outlet is a sort of conglomerate and appears to be able to stand on a rather steep slope. In two other cases, there was a silt accumulation at the outlet to a depth of more than 3 feet which condition may have a serious effect on the capacity of structures having a roadway over the top. The small amount of erosion at the outlet may be due to the lack of high flows, small ponds above permitting the silt to build up in the gully below, or type of stream bed material and vegetation.

"Definite conclusions should not be drawn until a more complete examination has been made on these and a large number of additional structures."

Runoff Studies - T. W. Edminster, Blacksburg, Virginia.-"A very considerable part of October was spent in completing the original analysis of the watershed data for the proposed Ridges and Valley Report. Initial comparison of the slope to the watershed peak rates was completed and the remainder of the TVA watershed data analyzed and plotted. Upon the completion of this phase of the work the Project Supervisor spent October 29-31 in the Washington office going over these data with D. B. Krimgold. A number of new and additional phases of analysis were outlined at that time and work will now go forward on this second step in the analysis.

"During the week of October 22 the Project Supervisor attended four Operations staff meetings in various parts of the State in order to discuss with the various District Conservationists and work unit men certain of the more important problems in their respective areas. Some time was spent in going over sources of new material that might be used by the Operations men in conducting their work. On the basis of these discussions it appeared that additional data to support the strip-cropping program, more information with regard to farm-pond design, sealing and materials and the quickest possible assistance on drainage design were of foremost importance in the field. There were also many questions of a purely agronomic nature which have been summarized and will be included in future discussions with the VPI Agronomy Department in regard to co-operative research in that field."

Hydraulic Studies -- F. W. Blaisdell, Minneapolis, Minnesota. -- "Mr. Blaisdell tested the curved transition floors constructed last month. These floors cause the jet to spread faster than does a flat floor, and the jet cross sections are in better agreement with the theoretical cross sections. These are the results expected. Pressures on the transition floor were somewhat greater than had been expected. Vertical pressure curves were also outlined at a few points."

Hydraulic Studies - V. J. Palmer, Stillwater, Oklahoma. -- "Since the middle of August the testing of vegetal lined channels has demanded almost the full time of the laboratory staff. The vegetations, Bermuda grass, weeping lovegrass and ischaemum (King's Ranch strain) are being tested for stability and retardance to flow in channels of various slopes and shapes. Bermuda grass and weeping lovegrass are tested both long and short."

Cover	Condition	Channel	Nominal dimensions		
			Bed	Bottom	Side
			slope	width	slopes
			Percent	Feet	
Bermuda	Long, green	U1	5	3	1/
	do	U2	5	3	do
	do	LLA	4	10	4:1
	do	LLB	9	10	4:1
	do	FC3A	3	0	10:1
	do	FC3B	6	0	10:1
	do	FC4	2.5	10	6:1
Weeping lovegrass	Short, green ^{2/}	U3	5	3	1/
	Long, green	U6	5	3	do
	Short, green	U5	5	3	do
Ischaemum	Long, green	U4	5	3	do

1/ Rectangular shaped channels with vertical plywood sidewalls in place only during the testing period.

2/ Kept mowed.

The above table was taken from Mr. Palmer's report.

Hydraulic Studies - A. W. Marsh, Corvallis, Oregon. -- "Soil samples were taken from the pots which have now incubated for 300 days. Percolation trials in quadruplicates were run as before on each of the 12 samples. Average percolation per tube at the end of 94 hours was:

Treatment	cc	Treatment	cc
Check	120	Alfalfa	101
Lime	235	" + lime	213
CaCl ₂	197	" + CaCl ₂	308
Gypsum	307	" + Gypsum	396
Sulphur	1218	" + Sulphur	1159

"The trend is gradually shifting more strongly in favor of the sulphur treatment. For the first time the alfalfa treatment was inferior to the check."

Hydraulic Studies - Stephen J. Mech, Prosser, Washington.-"All alfalfa plots were irrigated the second week of October. Thus they all go into the winter with a relative high moisture content. The water in the main canal was shut off about the middle of the month.

"We have about three times as much data for 1945 as we had in 1944. Calculation of the current season's data is our main work at the present and will continue to be so for quite some time to come. It is hoped that some tabulation or analysis can be made before the Annual Report is due."

Hydraulic Studies - Vito A. Vanoni, California Institute of Technology, Pasadena, California.-"Laboratory studies of Plan I of Storm Creek Spillway at Marianna, Arkansas, were completed and a summary of conclusions and recommendations was submitted to the Fort Worth office. Plan I for this spillway uses most of the walls at the existing structure, and it has a new crest, a new floor, and a new stilling basin. The design discharge for the structure is 6,475 cubic feet per second. The structure has a crest length of about 140 feet, and the width of the structure contracts down to 40 feet at the chute section. The main problem is to contract the flow without causing unusually high disturbance at the walls. The experiments showed that it was possible to improve flow conditions by a combination of varying the shape of the crest in plan view and by warping the floor in the contraction section."

Sedimentation Studies - Carl B. Brown, Washington, D. C.-"A brief report was prepared on certain aspects of the evaluation of bank-control measures on the Winooski River, Vermont.

"Mr. Glymph completed detailed sedimentation surveys of four reservoirs in the Sierra Nevada foothills. The results showed prevailing low rates of sediment production from the drainage areas and low rates of storage loss. Sediment production from the watersheds ranged from 47 to 319 tons per square mile, and annual rates of storage loss from 0.02 to 0.11 percent. These low rates result from the generally well-vegetated condition of the drainage areas. Conservation survey mapping of the drainage areas was almost complete at the end of the month."

Sediment Studies - Vito A. Vanoni, Cooperative Laboratory, California Institute of Technology, Pasadena, California.-"A first draft of a report was prepared on the field study of Pacheco Creek in San Benito County near Hollister, California. The study was made in connection with a proposed project to protect land adjoining the stream from floods. One of the important objectives of the study was to estimate the amount of sediment that the stream would carry into the problem area. The application of the analytical method of calculating the sediment load

was made extremely difficult, if not impossible, by certain conditions occurring in the stream. To begin with, it was very difficult to determine the actual slope because of the obstructions in the channel caused by vegetation-covered bars in the stream, clay dikes, and a pipeline crossing. Another factor contributing to the difficulty was the variability in composition of the bed material of the stream. This study is made interesting, however, because practically all of the sediment brought into the problem area was deposited in a newly constructed channel section, and the amount can be estimated by surveys. When the deposits have been measured, it will be possible to estimate the influence of the obstructions in the channels. This information can then be used to guide the development of this and other projects where similar phenomena occur. The completion of the report is being deferred until the necessary field information can be obtained on the amount of the sediment deposit."

Drainage Studies - C. Kay Davis, The Everglades Project, Fort Lauderdale, Florida.-"As far as we have been able to determine from results this year, ditch spacing of 1/8 mile is desirable for vegetable crops. Ditch spacing of 1/4 mile intervals seems satisfactory for grasses and feed crops.

"The salt which was brought in by high tides and covered a large portion of the marl lands has been leached and washed out by the heavy rains. If a relatively high water table can be held throughout the marl area during the coming cropping season, the chlorides may not have a toxic effect on the crops. The loss of nitrates caused by the heavy rainfall and leaching will build back as soon as the rains stop and the water table drops sufficiently to allow aeration of the surface layer."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"A mole point was installed on the Kilifer machine. We ran some trials on the test area and found it very satisfactory. With this point and the expander hitched to the center we do not get the gouging in the bottom of the mole channel. We polished the expander and some of these channels are exceptionally smooth. We also do not get as much rupture of the surface with this point and the machine seems to run more steadily. I really believe we have accomplished something with this hook-up. We have discontinued any further work on the mole area in order to move to the field.

"The cut which was graded at St. Delphine doubled the yield of the adjoining cuts. The yield was 26 bushels of corn per acre where the others yielded approximately 13 bushels per acre.

"We moved to Smithfield on October 15 and to date have graded two cuts, using the bulldozer on one and the grader on the other. Weather conditions have somewhat delayed the work. On the first cut we did the rough grading and then had a .3 inch rain. We tried to work it wet but did not accomplish much. However, it does give us some cost figures on trying to work the cut wet and may be a good point to the plantation owners. The second cut was graded with our grader and 50 Caterpillar. We

graded this cut in approximately 2 days' time. Surveys have been run on all these cuts, taking levels, and we will re-survey them after they are graded, in order to try to ascertain approximately all yardage moved and the amount required to be moved in crowning the cuts."

Drainage Studies - Ellis G. Diseker, Raleigh, North Carolina.-
"I, together with Dr. J. F. Lutz of the North Carolina State Experiment Station, Soil Department, Mr. W. D. Lee, North Carolina State Extension Soil Specialist and Mr. Jack Rigney of the North Carolina State College Statistical Department, visited several farms which had been previously selected, to check soil classification and uniformity of sizeable areas for the installation of drainage experiments.

It was determined that the following areas could be used for the drainage experiment:

- 1 area of Portsmouth soils near Farmville
- Several plots of Bladen silt-loam soil near Bethel
- 1 area of Portsmouth, Group 3 soils near Tarboro
- Large areas of Othello and Pocomoke, Group II soils, near Hertford
- Large areas of Stono and Portsmouth, Group II soils, near Hertford in Bear Swamp
- An area of Bladen soil near Edenton in Bear Swamp

"Prior to the above, the soils at the Plymouth Experiment Station were tested for uniformity. This area is the most uniform Bladen silt loam tested thus far. A differential survey of several plots, field ditches, and canal was made. Recently a topographic survey was made of 13 plots, each plot 260 x 1,300 feet and existing field ditches and main outlet. Six of these plots have been allotted for the drainage experiment. The formulating of a drainage district is underway in this area.

"A preliminary differential survey was made of 14 plots, each approximately 230 x 800 feet and existing ditches and outlet canal, at the farm of Mr. J. V. Taylor, near Bethel. The survey was made under my supervision by aids from Operations at the Greenville office. The combined length of the lead ditch and canal is 9,400 feet in addition to the other ditches. It will be necessary to deepen and clean out the main drain for a distance of 5,800 feet to a depth of .2 to 3.4 feet. Several test shots have been made and an estimate of the cost for shooting the ditches has been completed. To date it is not certain if Mr. Taylor is going to cooperate with us due to the high cost of the drainage installation, since it appears that he will have to defray all expenses. Detailed plans of the installations have been sketched and cost estimates made. With the exception of the Plymouth farm, the Bladen soil at Mr. Taylor's is the most uniform located thus far. It is hoped that financial conditions will permit the drainage installation on this farm.

"One thousand feet of ditch was shot at Burgaw for Operations.

"Approximately 350 feet of ditch was shot with dynamite at Macclesfield for Mr. R. B. Bailey of the Greenville Soil Conservation District."

IRRIGATION DIVISION

Evapo-Transpiration Losses Affecting Irrigation Practices - Salinas Valley, California. - Harry F. Blaney reports. - "Several days were spent in Salinas Valley and Berkeley with Paul A. Ewing and T. R. Simpson on studies of evapo-transpiration losses by native vegetation and irrigated crops. Normal annual unit consumptive-use values in feet were determined for the following classifications in the Preassure Area: Evaporation, 3.64; river channel, 1.74; swamp, 4.51; dense trees and brush, 4.84; medium trees, brush, and grass, 2.79; and sparse brush and grass, 1.63."

Santa Ana River Cooperative Investigation, Calif. - Dean C. Muckel reports. - "Regular weekly attention was given the evaporation and consumptive use of water stations in Santa Ana Canyon. A desert wind with high temperatures and low humidity blew during most of the week and the effects were noticeable in the amount of evaporation and transpiration. A series of measurements were made on observation wells. As a result of a light rain, the ground-water levels throughout the canyon rose a few tenths of a foot. The rain was not sufficient to penetrate to the ground-water level but did retard the rate of use by riparian vegetation and cause an increase in the river flow.

"I noticed that a temporary approach section had been installed at the Parshall flume in the Santa Ana Valley Irrigation Company Canal and in talking with Mr. Scott of the United States Geological Survey learned that the flume rating table had been consistently indicating 3 to 4 percent more water than his current-meter measurements. After the approach section had been installed, the rating table and current-meter measurements were together. The flume had been originally installed in the canal with head walls at the upper end at right angles to the flow with the result that a trough formed in the flume and the depth of water at the H_a point was greater than it should have been. The flume measurements are used as a basis for dividing water between two water companies and it is expected that a permanent approach section will be installed at the end of the irrigation season."

Evaporation from Water Surfaces, California - Willis C. Barrett reports. - "I am preparing a paper on 'A Critical Analysis of the Methods and Distribution of Irrigation in Border or Furrow Irrigation.' The object of this paper is to analyze all available data and present their fundamental physical meaning as far as these support some rational but scientific approach to a solution of the size-of-head and length-of-run problem in irrigation. From this it should be possible to prepare definite research and investigations for the practical solution of this problem. The importance of this problem may be realized when it is observed that the size of irrigation head and length of border or furrow are the fundamental variables in any irrigation problem for any type of soil. Yet no rational solution for this problem is available in published literature."

Pumping for Irrigation - Loss of head tests - Carl Rohwer reports.-

"I completed installation of 8-inch standard pipe at the Bellvue laboratory and started making loss-of-head tests. J. E. Warnock of the Bureau of Reclamation visited the laboratory at Fort Collins. He is interested in finding additional facilities for testing models in the event that the program of the Bureau is expanded during the postwar period. Professor Clyde also visited our laboratories. After completing tests on the flow through 8-inch standard pipe, I attached an 8-inch automatic drainage gate to the pipe and made a series of tests of the flow under the condition. The difference between the head required for any discharge through the pipe with gate attached and that for the same flow without the gate is the loss of head caused by the gate. The tests indicate that the percentage of the total head required to operate the gate increases as the available head decreases. For heads greater than 1 foot, however, the loss is small. I completed preliminary tests of loss of head through a standard 4-inch pipe at the Bellvue laboratory and installed a 4-inch gate valve in the pipe line in preparation for the tests of the loss of head through the valve at various gate openings. I spent a week at the Bellvue laboratory making observations on the loss of head through a 4-inch gate valve. During that period I completed the tests on the valve when $3/4$ open and started tests on the valve when $1/2$ open."

Irrigation Measuring Devices - R. L. Parshall reports.-"It was learned from the President of the Excelsior Ditch Board of Directors that about 15 of the nine-inch concrete Parshall measuring flumes have been built and were in use during August and September. Apparently he is very much pleased with the improvement in their method of distributing water to the users from this ditch. There are about ten more flumes to be built but because of the shortage of labor it will not be possible to get at the rest of this construction until some time next spring. Several measuring sticks for use with Parshall measuring flumes are being made at the Fort Collins laboratory, some of which are required for the Excelsior Ditch Installations."

Snow Surveys and Irrigation Water-Supply Forecasts - J. C. Marr reports.-"I accompanied Mr. Work on a snow-course inspection trip in Columbia Basin, British Columbia. This is the first time we have had an opportunity to go over the Columbia Basin snow-course network in British Columbia. The arrangements were made with the Department of Lands to have their Mr. Frame accompany us on this work. The necessary travel to cover the job amounted to approximately 4,300 miles. Generally, it was found that the Canadian snow courses were fairly well located and in good condition. Some of them are subject to winter melt on account of southern exposure and low elevations. It is desirable that additional high courses be established as soon as possible. The Columbia Basin in Canada covers a very large area, and much of it is very remote and inaccessible. However, there is opportunity to establish a few additional high courses. These locations were visited with Mr. Frame, and the desirability of establishing the new courses was suggested to him."

From a National Park ranger, R. L. Parshall learned about a new light-weight powered snow sled, one of which is in use at Steamboat Springs, Colorado. The power for the sled is a 2-cylinder motor-bicycle engine which moves in endless belt with cleats. Two men can travel on the sled. Under favorable conditions it is said that it makes 30 miles an hour.

R. L. Parshall reports that on September 30 the amount of water stored in the four principal reservoirs on the North Platte in Wyoming totaled 825,000 acre-feet, which is the most held in storage at that period of the season for many years. Because of this very favorable carry-over, the water supply for the North Platte, both in Wyoming and Nebraska, for next year, is now virtually assured.

San Joaquin Valley, Calif. Cooperative Investigation -
Dean C. Muckel reports.-"The average rates of percolation for the first 3 days and each succeeding 15-day period have been worked up for the 14 large spreading areas operated by the Kern County Land Company. Several of these ponds have been operated since 1936 and a variety of treatments tried so as to maintain high percolation rates. Similar data on percolation rates have been worked up for the large areas and the several test ponds of the Minter Field group. Preliminary study was made to find a correlation between the rates found on the test ponds (0.01 acre) and the large areas. The various ponds are being grouped according to soil type.

"Owing to lack of water in Lerdo Canal it was necessary to discontinue operation of the Minter Field ponds on October 5. This ended one of the longest spreading runs ever made on these ponds. They were started on December 5, 1944 and continued without interruption during the irrigation season."

Imperial Valley Drainage Investigation, California - Dorman plot water-table studies - William W. Donnan reports.-"Analysis of plotting of the water-table drawdown curve out from the newly constructed drain on the Dorman check plot reveals that the effect on the water table is very small. From a point out 100 feet from the new drain the water table slopes away from the drain, indicating the probability of clay dikes or clay strata sloping away from the drain."

Dean W. Bloodgood reports.-"I attended a meeting of the Pecos River Compact Commission in Austin. There was a large attendance from West Texas and Austin; and New Mexico was represented by the State Engineer and others. The State of Texas presented a tentative agreement, which was read in open meeting, giving Texas about 58 percent and New Mexico 42 percent of the Pecos River waters. Mr. McClure, State Engineer of New Mexico, desired to go into the agreement more thoroughly and proposed the next meeting to be held in Santa Fe, some time in the near future." (The division of the Pecos has been under study by the two states ever since the completion of the 1940 survey in which the Division of Irrigation had a prominent part.)

